METHOD AND RECEIVER FOR MANAGING THE CONSISTENCY OF SERVICE LISTS IN DIGITAL TELEVISION SYSTEM

This invention concerns the digital television field, and more specifically the processing of service information (SI) data. The implementation detailed below is mainly based on the DSS system (Direct Satellite System), even if the principle can easily be extended to other similar standards, such as the European DVB (ETSI document ref. EN300468) or ATSC (ATSC ref. A/56).

New generation digital television systems include the possibility to broadcast applications in the bitstreams. These applications can then be downloaded by the receivers (set-top boxes), and be executed on their CPUs in order to present to the user dedicated features related to the television services he or she can access. These applications are built on top of Application Programming Interfaces (API) that offer the basic features available on the set-top box with which the high-level features to be proposed to the user can be built. Existing commercial software packages provide such an operating system for digital decoders.

One major feature of a digital receiver device is the management of the service lists displayed to the user. One of the first data the integrated receiver/decoder (IRD) must acquire before being operational is an image of the broadcast service list, described in the guide data contained in the bitstream. Then, the IRD software offers customized features, among which the possibility to create customized service lists from this broadcast list and store them in non-volatile memory. One of these customized lists can then be selected and presented to the user. It is from this list, for example, a list of prefered services, that the user chooses the service he wants to watch.

The invention applies to IRDs operating on any type of broadcast network, either satellite, cable or terrestrial. It deals with an efficient way to manage the consistency between the different service lists derived from the

broadcast one by at least one user and stored in non-volatile memory. This has to be done in order to avoid such problems as a user or an applicationtrying to connect to a service contained in one of its custom lists that has disappeared or been modified in the broadcast streams.

Most up-to-date digital television systems offers the possibility to install IRDs (i.e. build the list of services accessible to the IRD – IRD standing for Integrated Receiver Decoder) by means of service information data. In the DSS system, this data is contained in what is referred to as the Master Program Guide (MPG) that describes the services contained in the physical transport channels (PTC), grouping them by segments. The advantage of using this as a reference is first to acquire all data necessary to build an up-to-date broadcast service list from one single frequency (sometimes called the "barker channel") and then to be able to update this information without requiring any action from the user.

A classical feature contained in IRDs is the possibility to build one or several customized service lists according to personal preferences, and to store them in non-volatile memory such that the user does not have to rebuild it every time the IRD is switched off.

When an update occurs in the broadcast MPG, and if the IRD is listening to new versions of this program guide, the list of broadcast services (which is resident in the decoder's memory and regularly updated) managed by the IRD software will be updated accordingly. If services have been deleted or modified (e.g. moved from one PTC to another), the customized service lists that have been derived from it should also be updated accordingly in order to make them consistent with it. Not performing this will result for the viewer in connections to non-existing services and hence unexplained black-screens.

The following methods could be used to verify the coherence of the service lists:

- notifying the viewer of a change and asking him to check or rebuild all customised lists; this has one major drawback to request an explicit action from the user;

- checking in the customised service lists whether their content is still compatible with the broadcast one as soon as this one changes; this other technique can be time consuming depending on the number of services and of service lists.

Both have as a major drawback the time consumption, in the first case from the user, and in the second from the CPU.

The latter case is a problem as it can happen at any time and monopolize CPU processing power. Indeed, if around 600 services are available, a comparison with a number of customized list of a few hundred services each may take a certain amount of time.

The object of the invention is a method for managing the consistency of service lists broadcasted by a digital television network, the service lists containing parameters corresponding to each broadcasted services and being received in a television receiver and stored in a memory, characterized in that, it comprises the step of :

- triggering means for updating said stored list,

- consistency checking between at least one stored list of services and a received list of service,

- updating the stored list in the memory of receiver with at least one parameter of the second list.

In this way, the consistency check is trigerred at a determined time so that that does not disrupt the receiver use.

Another object of the invention is a receiver in a digital television system containing a central unit, reception means to receiving broadcasted services and services lists, memory containing a program, a buffer memor storing customized at least one service list characterized in that the memory

contains a module for checking the consistency of service and a memory for storing an application adapted to trigger the said module, and that the receiver comprises means for checking the coherence between a list received by the reception means and one of the said customized lists.

Other characteristics and advantages of the invention will appear through the description of a non-restrictive embodiment of the invention, described in reference to the enclosed drawings:

Figure 1 is a block diagram of a television receiver implementing the present embodiment.

Figure 2 is a flowchart of the program module that manages the consistency of service lists.

The decoder of Figure 1 comprises a tuner 2 linked to a signal source 1. In the present embodiment, the signal source is a satellite dish and associated frequency converter. The signal provided by the tuner is demodulated by a demodulator 3. The demodulated data are corrected by a corrector circuit 4 and transmitted to a demultiplexer 5. The demultiplexer 5 includes a certain number of filters programmed by a microprocessor 23 in view of the requirements of the operating system of the decoder and the various applications supported by the decoder, for providing requested data packets. For the clarity of the diagram, only some connections of the microprocessor 23 are illustrated. Applications of the decoder include audio decoder 16, video decoder 17, teletext decoder/generator 18, a conditional access sub-system (including a decrypting circuit 7, a verifier circuit 8 for communication with a smart card 10 through smart card interface 9), and a service information module 19.

The data packets filtered by the demultiplexer are stored in predefined areas in a buffer memory 6 for access by the operating system and the

applications. If necessary, the received information is first decrypted by a decrypting circuit 7 depending on the user's entitlements stored in the smart card 10, before being stored in the buffer memory 6. Certain data packet types contain a description of the services broadcast in the network, and paths to the different components of each service. A service may comprise audio, video and other data components.

The decoder also includes an infrared receiver 24 for communication with a remote control 24, the said receiver 24 being linked to the microprocessor 23. The latter is connected to a memory 12 that includes the operating system as well as code and data for some of the applications. Code or data may be resident or downloaded. A modem 13 linked to the switched telephone network 14 is also controlled by the microprocessor.

A character generator 15 allows the generation of control menus relating to the parameters of the decoder or to a particular application. The video signal generated by this character generator is multiplexed with one of the video signals coming from the video decoder 17 or from the Teletext decoder 18 towards a first connector linked to a television 22 or a second connector linked to a video recorder 21. The multiplexing circuit 20 is managed by the microprocessor 23.

The service information module 19 is in charge of managing electronic program guide data. It consists in a program run by microprocessor 23, but is represented as a separate application in figure 1. The service information module enables the user to program a plurality of preferred service lists, such as a list for each family member.

The operating system of the decoder requests the microprocessor 23 to systematically extract from the received data stream information relating to the structure and content of the stream. This information is used to build a

list of broadcast services, which is stored in memory 12 and, according to the present embodiment, continuously maintained up to date.

Memory 12 contains a program module for generating a coherence check between the list of broadcast services and one or more preferred lists of services maintained by the service information module (or any other type of customized list maintained by an application). The module possesses an API (Application Programmable Interface) allowing an application to call this module for triggering a coherence check. The list of services to be checked is passed as a parameters through the corresponding function call.

Some advantages of such a solution are to propose:

- an automatic way to perform this operation (without any checking action required from the user, since the triggering can be carried out by an application),

- a time effective way to perform this operation, as it can be done for a given service list (not all of them) at a time controlled by the application; an application can thus determine when processing power should be allocated to this task.

The running of the module is illustrated by the flowchart shown in the figure 2. The check is a complete one, based upon the principle of verifying in the broadcast service list the content of each service contained in the given customized service list to be checked.

When the decoder is switched on, the operating system in memory 12 is booted (step 1). The operating system launches the service information module which instructs the microprocessor to continuously retrieve data packets relating to the Master Program Guide. The demultiplexer is configured accordingly by the microprocessor.

During a previous session, the user created a customized list of services through an electronic program guide (EPG), which is part of the service information module. For example, the user selected among all

services present in the Master Program Guide those services which correspond to his personal tastes. This customized list comprises for each service a service identifier, a service type (e.g. television service, radio service or interactive service), status information, title... This data is a subset of the data available in the Master Program Guide.

At step 2, at a time chosen by the EPG, the EPG calls the coherence check function of the module in memory 12. As a parameter, it passes the customized list to be checked. The moment chosen by the EPG to call this function is for example upon acquisition of the MPG after booting, or after a certain period of inactivity of the user, determined by measuring the last time he manipulated the remote control, or periodically – for example at night -, or when the EPG detects an error in a customized list. An error occurs for example when the decoder tries to access a service which is not available any longer. In this case, the user sees a black screen.

At step 3, the module initializes a pointer to point the beginning of the customized list to be checked. For each service in that list, the module verifies the presence of this service in the list extracted from the MPG (step 4). If the service is absent (step 5), then it is erased from the customized list (step 6). Else, the module checks whether the parameters for the service found in both lists are the same (step 7). If parameters differ, then the parameters of the customized list are updated (step 8).

In step 9, the module loops back to step 4 if all services of the customized list have not yet been checked. Else, the checking process is terminated (step 10).

According to a variant embodiment of the invention, for reestablishing coherence, the module checks whether the customized list should contain additional services, in particular services added to the MPG since the last coherence check of the customized list. This feature is applied for instance when the customized list is the result of a filtering process of the MPG list, and when the initial filter criteria are available to the module. For example,

the service theme or title or audio language may be a filter criterion. In this case, triggering the coherence check results in carrying out the filtering process anew, starting from the MPG list of services.

When this is done, the data corresponding to the customized service list that is stored in non-volatile memory are updated accordingly and the application that uses these data is notified of the end of the operation.

Sometimes, the received list does not contain a service that is still broadcast. In this case, it is preferable to wait a little time to update definitely the customized list even when the disappearance of the service is detected during a coherence check, in order to maintain across to this service. A solution to solve this problem consists of associating a counter with each service of the customized service list. These counters are initialized with a predetermined value, for example "3", when the service is recognized in the received list. If the module detects a service disappear once, the counter of this service decreases. When it reaches the value "0", all the parameters of this service are erased in the customized service list..

A variant consists of not using a prestored received list for the coherence check. If the memory space is too small, it is no possible to continuously manage and update a received list. When the module decides to update a customized list (step 2), the module requests the extraction of new tables from the digital multiplex. When these tables are received, the customized list can be updated.

Examples of application of this feature by a dedicated IRD are given below to illustrate the possibilities offered by such a mechanism. In fact, they correspond to two different broadcaster policies implemented through downloaded applications:

In the first IRD example, the preference service list edition is provided to a dedicated downloaded application called "electronic program guide" that also provides navigation and program information retrieval features. The

resulting lists are also used by another application called "surfing banner" that provides service connection and current broadcast information retrieval features. In such an IRD, the preference lists are checked against the broadcast one on two occasions:

- the first check is performed automatically when entering the given preference list edition screen in the EPG application,

as this preference list editing feature is not invoked that often by the user, the surfing banner application also triggers the operation when a connection error is notified to it following a service connection trial. Triggering is thus done an a as needed basis.

In the second IRD example, the preference service list edition is provided via the user interface embedded in the IRD. The preference lists are then checked against the broadcast one at a given time, for example at night. When this time occurs, the module is called

Both examples show that the invention allows to perform automatically the consistency check operation, at times when its either not disturbing (night-time) or when it is necessary (before editing the list, or when a connection error is detected). An additional advantage of offering the trigger through an API is that the policy can evolve depending on service and application requirements.

The benefits of the invention are to be able to provide an IRD with a feature that allows to check the consistency of all the customized service lists stored in non-volatile memory with the content of the broadcast one in an automatic but efficient way. On one side, its then an automated process, thus avoiding situations in which the user can select unavailable services or those in which she has to rebuild its customised service lists at each change in the broadcast. On the other side, the proposed process is time controlled. A fully automated one is very CPU intensive and disturbs a normal usage of the device. As the invention proposes to make the feature available through an API, it can be triggered at appropriate times depending on application features in order to minimize its impact on the user.

Although the embodiment concerns service lists, the invention can be adapted to other types of lists, such as for example event lists.